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The Transregional Dimension of Territorial Knowledge Management.

An evolutionary perspective on the role of universities

Work in progress

1. Introduction

“Space matters!” The famous quotation by Krugman has been confirmed by a great variety of theoretical methodologies and empirical investigations. And in most studies, knowledge is the driving force for economic growth in regions. Therefore, there must be evidence for a leading role of universities as “brain factories” in regional development processes. And again, everybody knows the famous examples of biotech clusters around the MIT in Cambridge, Mass., Stanford University, California, or Lund University in Sweden. Thus, universities have to be key players for regional development. And governments in all developed countries believe in it, supporting the emergence of technology transfer centres and university-industry-liaison networks, and improving the legal frameworks for the exploitation of intellectual property rights or the access to venture capital. But in only few regions, expectations on improved creation and diffusion of technological and business knowledge by these policies have been actually realised. As differences between “winner-” and “looser”-regions increase, fears are generated that advanced knowledge and its diffusion is concentrated in few centres and that transnational knowledge flows will not or only lately affect regions outside the successful centres. Is there an opportunity to transfer experiential knowledge between successful and lagging regions and to integrate more regions into transnational knowledge flows? And if so, what can universities contribute to suitable strategies? These are the leading questions of this contribution. For answering to these research questions, it is first of all necessary to get an understanding of

- prerequisites and structure of regional knowledge production and diffusion,
- the role of universities within these processes,
- spatial barriers to knowledge transfer and adaptation, and

- options for universities to overcome these barriers.

Therefore, a common methodological and strategic baseline is needed to know where to start from and how to proceed. This paper shall provide necessary elements of such a baseline from a more general point of view instead of presenting a complete model or an evaluated case study. Thus, further discussion and application will be needed to look for suitable implementation and further development of the thoughts presented here. The paper consists of three parts. In the beginning, the theoretical framework of territorial knowledge management is presented to connect the spatial and the knowledge dimension. Secondly, the role of the universities within such an approach to knowledge management in space will be investigated. This leads finally to the discussion of different strategies and instruments for universities and policy to overcome regional (national) boundaries of knowledge management. There will be no blueprint of successful interregional knowledge transfer at the end. Different strategies and instruments have to be adapted to the specific circumstances of single cases. The paper shall offer criteria for the understanding of these circumstances and necessary consequences.

2. Territorial knowledge management

Relationships between knowledge and regional economic development have been analysed from a great variety of methodological perspectives. Common lines of argumentation refer to the relevance of agglomerations, the availability of knowledge and human capital and the networking effects of knowledge. From a purely economic point of view, knowledge is the result of a production process, started with investments in the availability of human capital, patent licences and research labs, and leading to new products and production processes, implemented by ongoing increases of productivity driven by learning curve effects. But why are some companies more successful than others despite equal investments, and why do regions stuck in a lagging position despite public investments in human capital, the attraction of modern Greenfield investments, and the infrastructure for university/research-industry-liaison networks? Formal and informal institutions seem to matter, but also cultural and subjective factors, stressing that knowledge production and diffusion processes are more affected by social constructions than other production processes.

A similar experience can be observed within companies. “Knowledge management” is a buzzword used by nearly every business consultant. Companies should secure access to know how, know why, know what and know who, which requests the availability of huge quantities

of data and complex interlinkages between different knowledge bearers. Sophisticated ICT infrastructures and software should solve these problems. But in reality, most systems fail to improve knowledge flows within the companies, as employees were not motivated to document their knowledge, most documentations were restricted to codified knowledge and did not include the user-specific tacit experiences, and documented knowledge had to be translated before use, which reduces the advantages of such a system for the employees. The provision of data and infrastructures is not enough to increase knowledge flows and to improve the knowledge base of the single elements in the knowledge system. The social dimension of generating, using, and adapting knowledge has to be considered.

What does it mean theoretically? Models from learning psychology, cognitive and brain sciences try to link individual processes of recognising and processing knowledge in the brain with social interaction and construction. Exchange of experiential knowledge and arguments has always a cognitive dimension, which is not restricted to the pure content of a written text or spoken word. Learning psychology and brain sciences have shown that any new data recognised by a person is always led to a filtering process comparing it to existing patterns of genetically based or experiential knowledge. Divergences from existing cognitive patterns cause rejections or “exaptations”, as Gould has named it, i.e. utilisation for novel functions, which differ completely from original intended ones. This abstract explanation is illustrated in practice in many ways, when scientific experiences are misinterpreted by other disciplines or connected to concrete applications, which are far from original thoughts. Moreover, different objectives lead to different interpretation of new knowledge, which has to be translated between disciplines and areas of development and use. This work of translation can only be realised if common codes of communication – not only written and formalised, but also tacit and transferred by action – are available and used. Interdisciplinary and inter-firm project groups or informal communities of practice as well as the use of job mobility are examples for activities to build up common codes. For every participant, these activities have to be seen as investments – costs due to time expenses, social adaptation etc. –, which are irreversibly determined to improvements of communication and compensated only if the utilisation of the existing knowledge base can be improved and lead to additional revenues.

Three terms often used in the context of knowledge management are relevant within these processes of interaction. The individual *knowledge base* consists of theoretical and experiential knowledge stored within certain patterns and related to conscious processes of gaining

expertise as well as unreflected routines. Within a certain area, in the context of this paper it is referred to regions, this knowledge base can be more than the sum of individual knowledge capacities, if there are common codes and values inducing interaction and the emergence of new ideas and experiences. The understanding of codes and capability to transfer communicated experiences into the individual (regional) knowledge base are the *absorptive capacity*, which describes the potential to learn, i.e. to increase the knowledge base intended or unintended, by receiving information – in any possible way – from other persons. Linking individual knowledge and absorptive capacities by common codes of communication and processing can lead to a *knowledge system* describing a multitude of diverse possible interaction within the system and a separation from communication outside the system by restricting the codes and absorptive processes to insiders.

From an economic perspective these codes and systematic linkages have to be interpreted as network goods, i.e. goods, which benefit grows with increasing number of other users. The more persons utilise certain codes, the easier it will be getting into contact with them and the more opportunities for exchange of knowledge are given. But the benefits are also dependent on options to exclude from participation into the network, as instruments to sanction free riders in the network as well as source for competitive advantages. Communication codes are developed and adapted with time. Structures, participants and content of networks are therefore changing. But it is not rational to look for a complete rearrangement of rules for communication and cooperation in case of new challenges. Thus, formal and informal rules serve as means to prevent uncertainties about the behaviour of other participants within the communication network. Regional, sectoral or technological knowledge networks, which are often observed and a prominent objective public innovation strategy, have to be understood as framing organisations with general institutional arrangements, while the actual interaction and exchange of knowledge is realised within (sometimes overlapping) sub-groups depending on the contextual and temporary specificities of knowledge needed. Fluctuation and transition have to be natural phenomena within the sub-groups as well as referring to the evaluation of the framing networks.

Considering the network characteristics of communication codes and the influence of expected costs and benefits as well as free rider options of adapting to a communication code, willingness to active involvement into the development and adaptation of codes depends on

- the availability of already existing institutional norms and experiences within regions or sectors connected with high relevance of reputation for the participants, which can be used as a safeguard to reduce costs of monitoring and sanctioning, and
- high expected revenues by interaction increasing the motivation to improve communication and the acceptance of high costs of adaptation and the perseverance in case of early failures.

Even within one of the most prominent examples for these changes of producing knowledge, the biotech-pharma sectors, these problems of sustainable interdisciplinary and industry-academia transfer of knowledge can be observed, considering the changed perspectives for young companies specialised in single functions of the value chain from original identification of target genes to final pharmaceutical products. In the shadow of this general challenge to biotech markets, the multitude of lagging regions with visions of upcoming ‘Gene Valleys’ imitating successful regions in Europe and the US have to cope with high public expenditures for transfer and incubator organisations looking out for non-existing demand by private companies, as necessary linkages and communication codes are missing. In general, activities strengthening common communication codes are restricted to (spatial, technological, sectoral) areas with specific advantages due to superior scientific knowledge, existing experiences with industry-academia-linkages, and first mover advantages in markets.

3. Knowledge management in transregional context

Transregional flows of experiential knowledge might look as an opportunity for lagging regions to get input and missing links to functioning knowledge networks as necessary prerequisites for their own catch up processes. Knowledge flows can refer to the transfer of institutional experiences as well as to scientific and industrial expertise or education. The term “transregional knowledge flows” refers to a context, where the spill over of knowledge is not ubiquitous, but restricted to spatial areas, while the exchange and development of knowledge is not restricted to single persons or organisations, but leads to different applications and adaptations of companies, R&D labs and institutes, or schools within the affected regions. In general, these flows do not affect all regions equally – like the buzzwords of “globalisation” and “internationalisation” imply –, but are concentrated to ties between regions in different countries where relevant knowledge for certain technological paradigms is located. Therefore,

we use the term “transregional” or “transnational” to describe this plurilocal but not ubiquitous phenomenon. For regional economic development, inclusion into transregional knowledge flows offers the opportunity of access to experiential knowledge for processing and learning without the need of concentrating all relevant elements of a knowledge base for certain technological paradigms and sectors within the region. Thus, knowledge could be used as competitive advantage – unique selling argument – in case of successful combination of access to locally bounded knowledge and interacting structures with inclusion in transregional flows of expertise. This intended cause-effect-relationship for regional economic development fails, if

- the locally bounded knowledge base is not connected with market-related applications within the region, thereby losing its regional inclusion,
- the regional knowledge based networks lose the connection to transregional knowledge flows, or are too dependent on single persons or events to obtain a sustainable unique selling position.

Two typical ways of improving transregional knowledge flows can be observed: (1) the compilation of data by scientific benchmarking studies of success factors, visits to and from success regions, or licence contracts to use protected knowledge; (2) the import of ‘brains’ by relocating firms or single persons, FDI, joint research, education or application. Considering the relevance of non-codified knowledge and the access to codes of communication embedded in routines and socialisations, superiority of the latter strategy seems to be inevitable. But both strategies have to cope with basic challenges caused by divergences of economic, institutional and cognitive conditions within the affected regions.

Economic conditions refer to the sectoral structure of the regional economy, important demanders and cooperation partners for research labs and universities, and existing transregional trade patterns. Institutional conditions do not only include formal contracts and arrangements between companies, institutes, and the public sphere, but also informal norms of trust, reputation and ethical values that make it easier to look for new forms of communities of practice and research teams by referring to relational contracts that can be adapted with time. Cognitive conditions – like risk proneness, bias to certain applications or theoretical models, organisational models of knowledge production – are hardly to describe, but show their importance while affecting transregional cooperation. It is therefore necessary to process any experiential knowledge for the preparation and realisation of new transregional arrangements, in particular

to identify and cope with the cognitive conditions in the region. Differences in economic, institutional and cognitive conditions between the affected regions request adaptations of the ways to produce, exchange, utilise and improve knowledge, which again cause time expenses and uncertainties. An attractive – quick and easy – blueprint for regional policymakers to locate a public research lab in a lagging region, which leads to relocations of private investments from developed regions and improvements of the regional knowledge base, cannot be given. Instead, time consuming processes of strategic decision making and monitoring are needed to realise advantages from transregional knowledge flows. Necessary prerequisites are

- the identification of endogenous knowledge potentials and needs for transregional input,
- decisions on strategic objectives for a support of transregional knowledge flows,
- the recognition of specific barriers to transregional knowledge flows due to divergences and instruments to overcome them,
- decisions on strategic planning (steps, milestones, criteria for evaluation) of activities to achieve the objectives of increasing competitiveness of the regional knowledge base,
- determination of processes to discuss strategic achievements and necessary corrections of strategic planning.

These processes cannot be managed by central regional planning organisations, but have to be developed in close connection between companies, universities and research institutions, while public administration might be involved as moderator or supporter. As huge uncertainties exist on sustainable processes of transregional knowledge flows, all steps within these strategic processes have to be seen as necessary elements of learning, which means that continuous documentation and processing of experiential knowledge about transregional cooperation is needed.

In the following these general thoughts on transregional knowledge flows will be concentrated to the role and options of universities as producers of scientific research expertise and educated skills. Four different strategies will be discussed representing different objectives, prerequisites, target groups and instruments: (1) the strategic appointment of foreign professors, (2) cooperation with foreign universities in the field of research and education, (3) participation in international university franchise systems, and (4) building up and strengthening alumni networks as bridge to foreign knowledge bases.

4. Universities as elements of transregional knowledge systems

More than ever, universities are faced with new requests, which are based on the experience of increased relevance of knowledge and scientific expertise for regional economic development and bottlenecks in public funding. Therefore, the two main functions of universities, producing research expertise and educating highly skilled persons, are connected with two additional characteristics, which are not necessarily complementary: excellence and applicability. Excellence refers to the general challenge for regions attempting to use their knowledge base as a strategic argument for FDI and mobile highly skilled persons that this strategy requires the proof of internationally unique expertise. Companies looking for contract research partners or profitable investments in university spin offs want to be sure of the quality of expertise they acquire. Students looking for courses and degrees with bright career perspectives have to consider the scientific reputation of the universities. Those universities and related research institutes providing this excellence could help the region to attract highly skilled persons and research labs of multinational companies making it to a “centre of excellence”, which characterises the spatial concentration of unique expertise within a certain field (discipline, group of technologies) that makes it inevitable for every researcher in this field to come to this region or keep in close contact with the content and communication codes there. This unique position offers the option of sustainable competitiveness, as changes of paradigms and necessary adaptations of the knowledge base can be foreseen early and coped by appointments of “new brains”.

But during the last three decades, the old ethos of universities producing excellence seemed not enough to support economic development. Biotechnology and ICT are well-known examples for the amalgamation of former separated scientific processes of basic research and in-firm application. Spin offs from universities and research institutes show the close connection between scientific and market activity. In particular for Continental European universities, these developments cause a major change of the traditional image and possibility to refinance. Universities should no longer produce only abstract excellence, but also knowledge, which can be applied directly in production processes. Whereas former cooperation was concentrated more or less to research contracts between the research labs of big multinational com-

panies and universities,¹ cooperation with SME, start-ups or even crafts companies is now requested to extend the impact of universities on the regional knowledge base. Therefore, the demand for applicability does not only refer to commercialisation of excellent science at universities by patents, selling licenses or university spin offs, but also to interaction with regional companies in mature markets looking for incremental firm-specific improvements of productivity and products. Universities should act as transmitters between scientific research and the regional knowledge base.

With changing demand, new instruments of public support of universities were introduced. Activities to achieve excellence in university research and education refer to conventional investments in real capital and personnel, but also to public incentive schemes connected with private research funding (public-private-partnerships). Specific organisations (university and science parks, incubators, technology transfer companies or industry-academia-liaison offices) should help to improve the applicability of university expertise and the emergence of common communication codes between universities and venture capitalists or between universities and regional companies. But a lot of studies show that much too often these activities only serve as additional instruments without impact on structural incentive schemes and cognitive patterns. Therefore, lacks of interdisciplinary cooperation, “corporate culture and missions” of single universities, common understanding and time frames of funding managers and researchers, and compatibility of methodologies and expertise between university researchers and SME still prevent a more prominent role of universities within regional knowledge networks or sectoral clusters.

How can transregional knowledge flows to universities help to change these basic difficulties in converting the value within the brains into market value? Four different strategic directions of attracting transregional knowledge flows to regional universities shall be investigated to find answers to this question. By comparing four different directions, two important messages for decision-makers shall be illustrated. First, there is no “one-fits-all-strategy” to utilise transregional knowledge flows to universities. Instead, the existing potential and experiences within the university, regional location conditions and economic structure as well as the constellation within the inter-university have to be considered and activities to increase transregional knowledge flows have to be seen as contributions to unique-selling profiles. Secondly, the directions are neither a complete set of strategies nor exclusive. Every university will have

¹ In Germany, the traditional separation between universities and applied universities („Fachhochschulen”) additionally influenced the self-consciousness of universities.

to look for a suitable combination of instruments to achieve the maximal transregional impact to the corporate (regional) objectives. But the different directions represent different sets of options and prerequisites, which have to be considered when thinking of a suitable set of instruments.

- *transregional knowledge inflow by appointments*

An obvious way to increase the transnational knowledge inflow leads to the import of “brains” by offering researchers from other regions or countries university chairs or leading positions in associated institutes. New “brains” cannot only improve the regional knowledge base by sharing expertise with incumbent researchers and companies but also serve as an argument to attract other researchers or companies in technologically advanced sectors thereby creating a “centre of excellence”. But besides considering the necessary expenditures for raising the attractiveness of excellent and/or successful researchers, the availability of two main prerequisites has to be investigated. First of all, the prerequisites and possibilities to integrate the new researcher into existing regional knowledge systems or cooperating with the new researcher to build up new knowledge systems have to be checked. Even if there might be compatible scientific expertise, divergences of cognitive patterns, social and cultural norms as well as scientific routines could reduce the space for interaction and increase the necessary time for adaptation and identification of cooperative projects. Secondly, the impact on attractiveness as location for research, production or services is not only determined by access to a leading researcher. Without additional regionally bounded factors of competitiveness (depending on the specific request of different sectors and technological paradigms) – e.g. access to attractive sales markets, human capital and advanced business services, degree of urbanisation, systems of regulation – the impact on regional economic development will be limited and temporary.

- *transregional knowledge inflow by contractual agreements*

In this context, transregional cooperation between university researchers or between university researchers and companies is relevant. Inclusion within transregional knowledge networks is essential to keep the access to leading edge expertise and to get new inspiration for own research and application. From a regional perspective, impact on regional knowledge systems depends on the compatibility between the transregional and intraregional activities and the relevance of secrecy between the cooperation partners. If there is no linkage for the university researchers into regional knowledge systems, transregional cooperation might be

only the first step of migration to the other region. If there are linkages into regional knowledge systems, transregional cooperation might cause fears of violating protection of secret knowledge, which reduce the intensity of cooperation. But there is also the possibility that transregional research cooperation marks a first step on the way to deeper transregional cooperation between regional knowledge networks each using access to compatible transregional knowledge to increase the profit of their specific tacit knowledge base.

- *transregional knowledge inflow by franchising*

The complete inclusion of the regional university within an international (transregional) franchising system marks another way of increasing transregional knowledge flows. Internationally oriented universities create systems of certified courses and degrees, which are managed centrally and offered under a common label. The university teachers are mainly recruited within the regions and integrated into common staff development policies. For an internationally oriented university, such a system offers the opportunity of cheap supply of basic courses in economically lagging regions, while securing international access to a common baseline of knowledge for graduates and postgraduates. For economically regions, this strategy offers an option to internationally standardised knowledge as a starting point for further research and contacts to future highly skilled persons, which are interested in cheap schooling costs during their undergraduate period. Such activities can be relevant for regional knowledge networks with deficits in access to standardised technological or marketing expertise, e.g. old industrialised regions in Central and Eastern Europe. Personnel with standardised skills could improve the access to international value chain networks and further improvements of the knowledge base. But without existing regional knowledge networks and experiences these franchise universities will only serve as isolated suppliers of knowledge.

- *transregional knowledge inflow by alumni networks*

For many US universities, alumni associations, “old boys networks”, are very common and an attractive instrument to underline the career perspectives of students, to increase private funding and to contribute to the education by offering practical experiences. From a regional perspective, this could also open up the doors for transregional cooperation of firms, as common experiences within university could reduce barriers of first contacts, and common rules within the alumni networks could serve as reputation. But this requires on the one hand side an active corporate policy of the university, including a mission statement with common guidelines, public image and implicit routines as well as the involvement of alumni within the organisa-

tional structure of the university. Therefore, only those universities will be successful in integrating alumni, which obtain a certain homogeneity and common internal culture. On the other hand side, alumni will only be relevant for regional economic development, if the university offers degrees of excellence that have a transregional relevance and if the university is integrated into regional knowledge networks at least by causing effects on regional staff development policies.

4. Conclusions and outlook

Processes of globalisation and increasing relevance of knowledge have drastically changed the image of universities as well as the demand on university products. It is quite common to criticise the output of universities and the integration into the regional economy and to look for input by transregional knowledge inflows. But these typical reactions overlook basic difficulties of regional knowledge management as well as the need to differentiate between different options to increase transregional knowledge flows. This paper offered an introductory overview to a theoretical and interdisciplinary framework to analyse regional knowledge systems and barriers to include universities into them. Furthermore, it was shown that there are instruments to increase the impact of universities to regional knowledge systems by transregional knowledge inflows but the decision on suitable instruments depends on the profile of the university and the regional economy as well as on the strategic objective of transregional knowledge inflows. Neither universities nor regional policymakers will be able to define such a strategy. But it would be a great step forward if they would accept the necessity of a regionally specific strategy and the adaptation of such a strategy for each element of regional knowledge systems to the regional conditions. Further research will be necessary to link the theoretical framework with empirical indicators to investigate and evaluate the strategic options.

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